OPERATING INSTRUCTIONS

Chrome-Line

MOTOR TUNE-UP EQUIPMENT

by HEYER

HEYER Chrome-Line MOTOR TUNE-UP EQUIPMENT

HEYER INDUSTRIES

CHROME-LINE MOTOR TUNE-UP EQUIPMENT

One Year Warranty

The Projector Tube and all parts, except light bulbs and fuses are guaranteed against defects in material and workmanship for one year from date of receipt by the original user, subject to the conditions stated below.

1. LIABILITY OF MANUFACTURER UNDER THIS WARRANTY

Our liability is limited to repair and/or replacement of parts that become defective within one year after receipt of the equipment by the original user and are reported within that period to the distributor who sold it. Failure caused by accidents, alterations, misuse, normal wear or improper packing of returned units is not covered by this warranty.

The rights under this warranty are limited to the original user and may not be transferred to subsequent owners.

Claims for labor and/or material will be considered only if accompanied by a properly filled out Warranty Claim Tag HY-57 which bears the authorization of the Distributor who sold the equipment.

2. TRANSPORTATION CHARGES

Transportation charges on all returned equipment that is within Warranty must be paid by the shipper and repaired units will be returned transportation prepaid. Damage cause by improper packing of returned equipment is not covered by this Warranty.

3. WHAT TO DO IF YOU HAVE TROUBLE

First: Check operating instructions. Be sure power sources (Batteries or AC) are normal. Refer to trouble shooting section in the Instruction Manual for hints that may locate the difficulty quickly, if it is in the test connections or operation of the unit.

Second: Try unit on another car — the trouble could be in the car rather than the equipment.

Third: If trouble persists, contact our distributor from whom you purchased the equipment and authorization will be given for local service or return of the equipment to the factory. This must be done with our Warranty Claim Tag HY-57 or the claim will not be considered.

by B. M. Heyer

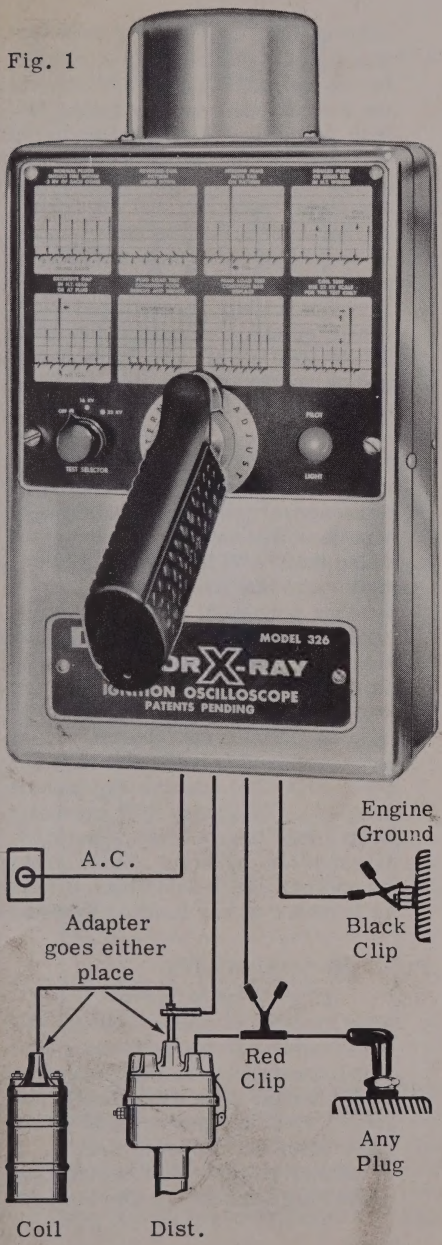
President, HEYER INDUSTRIES INCORPORATED
BELLEVILLE 9, NEW JERSEY

This Warranty administered by
HYPROD SERVICE INCORPORATED
Bangor, Pa. U.S.A.
Service Division for Heyer Industries' Equipment

MOTOR X-RAY "JOB FINDER" SCOPE Model 326

OPERATING INSTRUCTIONS

Fig. 1



EXPLANATION OF TESTER CONTROLS

There are eight patterns illustrated on the front of the tester depicting various normal and abnormal ignition conditions for easy comparison with patterns obtained from the engine. See Fig. 1.

The TEST SELECTOR switch has three positions, "OFF", "16 KV", and "32 KV". The OFF position disconnects the tester from the A.C. current. The "16 KV" position is used for all spark plug tests, with each horizontal line being equal to 2 KV and is read at the left side of screen. The 32 KV scale is used to check coil output and is read at the right side of the screen, each horizontal line being equal to 4 KV.

PATTERN ADJUST control located underneath the handle of tester is used by rotating knob to left or right to hold the pattern on the screen and prevent the firing patterns from sweeping off.

When tester is consuming electrical current the test light will light. The test light must always be lit when the TEST SELECTOR is in the 16 or 32 KV position. If it does not light with the Test Selector in these positions, check to see if the tester A.C. plug is plugged into the A.C. outlet and is making good contact and that A.C. line is "live".

With the TEST SELECTOR in the "16 KV" position the normal pattern you will get is shown in Fig. 2, and consists of the complete firing patterns for all cylinders (6 cylinders in this picture). This is called a "parade" pattern. In this parade pattern we are able to clearly see the rise in voltage that "ionizes" the plug gap and causes the plug to fire. This is actually the only thing we are interested in looking at in this "parade" pattern, because, as will be seen later,

this firing pattern tells us exactly at what KV the plug is firing-which determines its condition.

With the TEST SELECTOR in the "32 KV" position you will notice that the pattern is only 1/2 as high as it was when the 16 KV range was used, and the firing voltage should be read from the right-hand 32 KV scale.

The 32 KV scale is for checking the maximum coil voltage, which appears as shown in Fig. 9 if the plug wire is removed at the plug or at the distributor. (Any wire may be removed to get this pattern except the one connected to the RED Clip.

TEST CONNECTIONS. Fig. 1.

a. Plug A.C. cord into suitable outlet.

b. Connect RED clip over any plug wire.

c. Ground BLACK clip to engine.

d. Insert lead with ADAPTER into distributor or coil tower (Distributor preferred). Reconnect Coil-distributor lead to the open end of this adapter.

HOW TO MAKE IGNITION CHECK WITH THE "JOB FINDER" SCOPE.

a. Turn TEST SELECTOR to "16 KV" position. (Pilot light on tester should light. If not, check to see that A.C. cord is properly plugged into outlet and is making good contact and that A.C. line is "live".)

b. Start engine and operate at about 1000 RPM. (Engine must be at operating temperature for this test since a cold engine will be affected by the automatic choke and general inefficiency due to vaporizing fuel with cold air will affect the firing voltages of the plugs.) You will notice that at idle speeds all cylinder firing patterns will not appear on the screen. As you speed engine up the firing patterns will condense and at about 900 RPM all cylinders are just within the left and right limits of the screen and you have 900 to 1000 RPM. (A Tachometer is not necessary for this test, as speed is not critical).

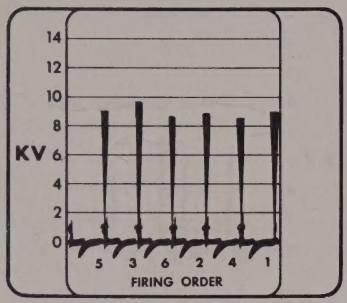
c. Rotate PATTERN ADJUST control until firing patterns from all cylinders appear steady on the screen. If pattern will not hold on screen by using the PATTERN ADJUST control move the RED clip pick-up to another plug lead. Totally defective spark plugs, leakage between ignition wires, cracks or carbon tracks in dist. cap causing flashover can cause this condition. Difficulty in holding pattern can also be caused by allowing the RED clip lead and lead with the adapter to become tangled. To avoid this condition keep these tester leads separated. If condition persists check tester on another car to determine if fault is in tester or car ignition system.

PLUG NO-LOAD TESTS

a. Plug circuits in good condition will have regular firing patterns and at approximately the same KV read on 16 KV Scale. The usual limits are from 6 to 10 KV and within 3 KV of each other as shown in Fig. 2. If a normal pattern is obtained then make Plug Load Test. (See Page 4).

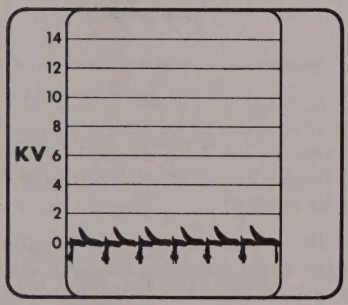
OPERATING INSTRUCTIONS

Fig. 2 **NORMAL PLUGS SHOULD FIRE WITHIN 3 KV OF EACH OTHER**



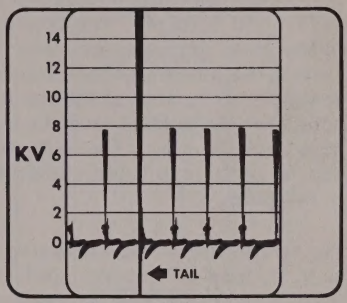
b. If the pattern appears as shown in Fig. 3 with no normal firing voltages it indicates reversed coil polarity. This condition is caused by the primary wiring connections to the coil being reversed. It will be necessary to correct this condition before proceeding with the tests.

Fig. 3 **REVERSED COIL PATTERN UPSIDE DOWN**



c. Fig. 4 shows one spark voltage line extending upward off the screen and with a tail extending downward underneath the base line, indicates a missing plug. (The presence of this long "tail" always indicates a miss).

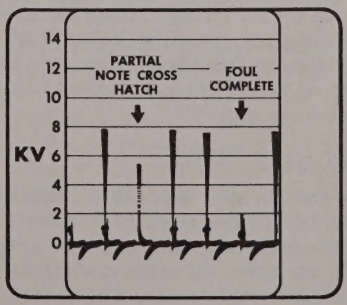
Fig. 4 **MISSING PLUG NOTE TAIL ON PATTERN**



d. Fig. 5 illustrates a fouled plug or series resistance in the H.T. wiring. A partially fouled plug or high series resistance will appear with a cross hatch in the firing voltage line.

A completely fouled plug as shown in Fig. 5 will be indicated by a very low firing voltage line. This low voltage can be caused by a ground in the wiring, cracked or carbon tracks in distributor cap, or a fouled plug. To determine where the fault lies remove the plug wire from the affected plug. If the firing voltage

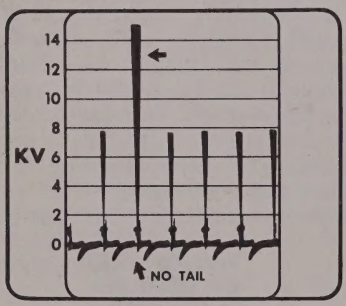
Fig. 5 **FOULED PLUG OR SERIES RES. IN H.T. WIRING**



line rises off scale this shows that there is no ground in the wire to the plug or in the distributor cap for if there were the voltage could not rise to full coil voltage. The trouble is in the plug. If, however, when removing the plug wire the firing voltage pattern remains at the same low point then the trouble must be in the wire from the plug to the distributor cap or in the cap itself rather than in the plug.

e. Fig. 6 illustrates an excessive gap in H.T. lead or in plug. Note that there is no tail extending downward as shown in Fig. 4. To pinpoint gaps in plug circuit the plug wire

Fig. 6 **EXCESSIVE GAP IN H.T. LEAD OR AT PLUG**



should be grounded at the plug end and the KV firing voltage observed. If it does not drop below 5 KV, it indicates that there is an open in the wire rather than a plug with an excessive gap.

PLUG LOAD TEST

This test is not necessary if the previously described no-load plug tests indicate excessively high, low or erratic firing voltages, or wide variations between plugs that require servicing anyway. If, however, the no load test shows plugs that seem to be firing satisfactorily and within 3 KV of each other yet have more than 3000 miles of use proceed as follows:

Fig. 7 **PLUG LOAD TEST CONDITION POOR REMOVE AND SERVICE**

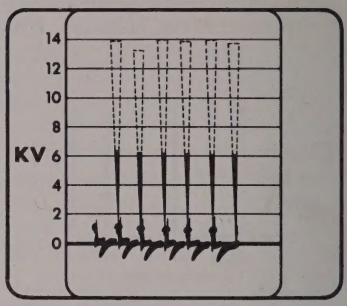
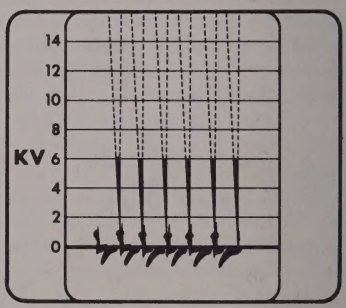


Fig. 8 **PLUG LOAD TEST CONDITION BAD REPLACE**



With the engine at idle RPM open the throttle very quickly, running the engine up to 2000-3000 RPM then back to idle. Watch the firing voltages of each plug. The pattern will condense and the firing voltages will momentarily increase as the compression increases in the cylinders. See Fig. 7 and 8. Repeat test several times to verify findings.

New plug firing voltage will increase only a few KV. Plugs with 5000 miles will increase more and bad plugs may more than double. In other words, the more wear on the plug the greater voltage will be required to fire it under load.

If the firing voltages under load increase to 12 to 14 KV as shown in Fig. 7 the condition of the plugs is poor and they require servicing.

If the firing voltages under load increase to 16 KV or shoot off the screen as shown in Fig. 8 the condition of the plugs is bad and they must be replaced.

COIL TESTING

Turn TEST SELECTOR to 32 KV position. Operate the engine at approximately 1000 RPM and remove a plug wire (at either distributor or plug). This will cause the spark voltage for the affected cylinder to increase and it will indicate the maximum coil kilovolts output read on the 32 KV scale on right side of screen. Fig. 9 shows a coil output of 28 KV. The reading obtained should be compared with the specification for that car contained in the Heyer Tune-up Roller Specification Chart Model 381. If the coil KV is more than 3 KV below normal, it may be caused by low voltage at the coil. This can be caused by:

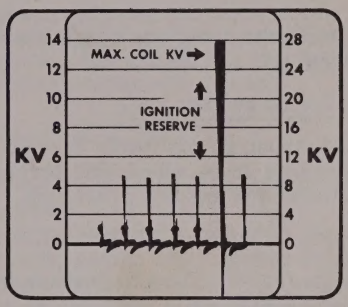
a. Insufficient charging voltage, due to a low setting of the voltage regulator.

b. Generator not charging.

c. Battery is discharged or defective.

These conditions can be located with the Heyer Model 322 Amps.-Volts Regulator-Tester and must be corrected and the test repeated before condemning the coil.

Fig. 9 **COIL TEST**
USE 32 KV SCALE
FOR THIS TEST ONLY



CHECKING IGNITION RESERVE

(Make test at 1000 RPM)

The pattern in Fig. 9 shows the reserve coil K.V. for a typical 12V system. Since all cylinders fire between 8 and 9 KV it is evident that the reserve KV in the coil for those cylinders is the difference between 9 and 28 KV or 19 KV which is satisfactory.

As engine speed increases the coil output decreases and as load increases the voltage required to fire the plug increases. Both conditions eat into this ignition reserve which should always be more than 1/3 of the maximum available Coil K.V. (Make plug load test when checking ignition reserve - see page 4).

PLUG CIRCUIT IDENTIFICATION

To identify any particular plug circuit that indicates trouble-connect the RED clip to the No. 1 plug H.T. lead. The No. 1 plug spark voltage will now appear at the right side of the screen with the balance of the firing order starting at left side of screen. Fig. 2 illustrates the firing order sequence of a 6 cylinder engine with the RED clip connected to the No. 1 plug H.T. lead. See next page for firing order and location of #1 cyl.

MOTOR X-RAY "JOB FINDER" SCOPE Model 326

OPERATING INSTRUCTIONS

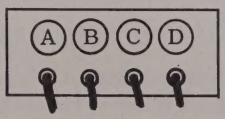
WHAT TO DO IF YOU HAVE TROUBLE WITH SCOPE

1. Recheck operating instructions which point out possible causes of malfunctioning due to ignition system and not scope.
2. Try on another car.
3. If trouble continues contact the source from which you purchased tester for service procedure.

SCOPE INTERNAL ADJUSTMENTS

The four holes across the bottom of the tester found in some units are provided for factory use in making final alignment, focus and brightness adjustments. These should not be altered except in our authorized repair depots. (Our distributors have list of these). The only time they need readjustment in normal use is when a new tube is installed. We suggest you read the warranty information on the inside front cover of this instruction or on the Warranty Card itself, which is included with each scope. Units made inoperative by alteration of these internal adjustments are not considered within Warranty.

For the benefit of those familiar with oscilloscope adjustments, such as TV service depots, the following information is furnished.



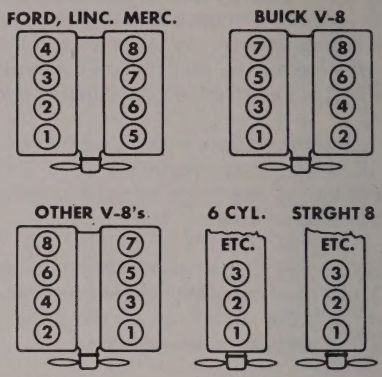
A. Vertical adjustment for aligning base of pattern with "0" line.

B. Horizontal adjustment to place all firing voltage lines on screen at 900 RPM.

C. Focus adjustment.

D. Brightness adjustment.

CYLINDER LOCATIONS (U.S.A. CARS)



FIRING ORDER U.S.A. CARS

ALL V-8 ENGINES

Cadillac '49-'59	Nash
Chevrolet	Rambler
Chrysler	Packard
DeSoto	Plymouth
Dodge	Pontiac
Hudson	Studebaker

18436572

Ford-Lincoln-Mercury-Edsel except 1958-59 Ford 292, Edsel 292 and Mercury 312 engines

Up to 1957	1958-59
15486372	15426378

Ford-292-Edsel 292-Mercury 312 1958-59 engines
15486372

All Buick V-8's
12784563

ALL STRAIGHT 8 ENGINES
16258374

ALL 6 CYLINDER ENGINES
153624

ALL 4 CYLINDER ENGINES
1342

POWER TIMING LIGHTS Models 317B and 319

OPERATING INSTRUCTIONS

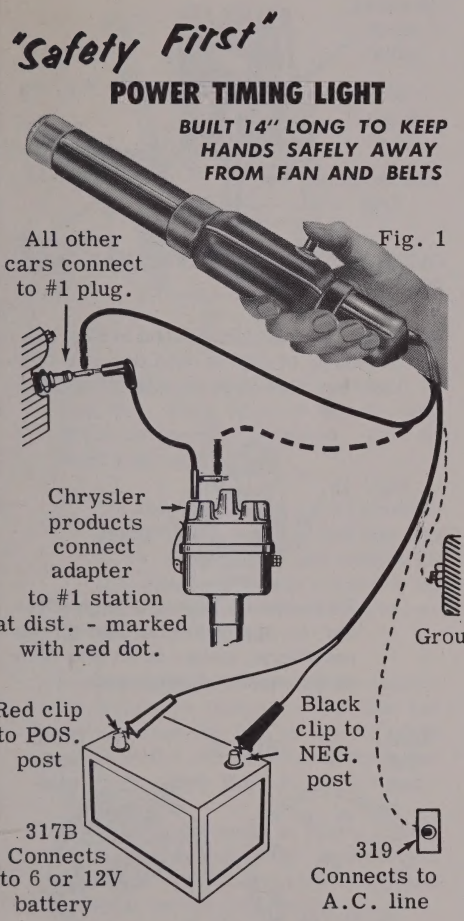

"Safety First"
POWER TIMING LIGHT
BUILT 14" LONG TO KEEP HANDS SAFELY AWAY FROM FAN AND BELTS
All other cars connect to #1 plug.
Chrysler products connect adapter to #1 station at dist. - marked with red dot.
Ground
Red clip to POS. post
Black clip to NEG. post
317B Connects to 6 or 12V battery
319 Connects to A.C. line

Fig. 1

TIMING INDICATOR POINTER AND DEGREE MARK LOCATIONS

Timing indicator pointer will be located either on the flywheel housing at rear of engine or at harmonic balancer in front of engine. This information is contained in Heyer Tune-up Roller Chart Model 381 and is also available in replacement parts makers specification books.

If located on flywheel housing, remove timing slot cover plate. Timing degree marks are located on flywheel.

If located at harmonic balancer in front of engine, timing degree marks are located on harmonic balancer.

TIMING ADJUSTMENT

a. Remove coil wire from coil or distributor.

b. Crank engine until timing degree marks are visible.

c. Clean and chalk mark degree line specified by manufacturer.

d. If specified by manufacturer - disconnect vacuum advance line at carburetor. Seal carburetor opening with masking tape.

e. Loosen distributor hold down clamp bolt just enough so that distributor can be rotated with a little pressure.

f. Connect timing light. See Fig. 1.

g. Insert coil wire and start engine.

h. Adjust idle as specified by manufacturer.

i. Direct timing light at timing marks and rotate distributor until specified degree mark is lined up opposite of timing indicator pointer.

j. Tighten down distributor hold down clamp bolt.

k. Connect vacuum advance line if disconnected.

l. Adjust idle RPM to manufacturers specifications.

POWER TIMING LIGHTS Models 317B and 319

OPERATING INSTRUCTIONS

GENERAL INFORMATION

1. Lubrication See Fig. 1a.

   a. If the distributor is the "oil reservoir" type - fill reservoir with light engine oil every 10,000 miles.

   b. If the distributor is not the "oil reservoir" type - fill the hinge cap oiler every time car is lubricated.

   c. Every 5,000 miles, (at Tune-up)

      Apply a trace of Cam and Ball Bearing Lubricant to breaker cam.

      Three or four drops of light engine oil to wick located under rotor.

      One or two drops of light engine oil to the breaker lever pivot.

      Three or four drops of light engine oil to the Lubricating Felt between the plates of the vacuum advance breaker plate assembly.

2. Visual Inspection during tune-up.

   a. Check distributor cap for carbon tracks, cracks, burned electrodes.

   b. Check rotor for burned segment or carbon tracks.

   c. Check breaker points for burning, pitting, or oxidation.

   d. Check wiring for worn insulation, loose connections at terminals.

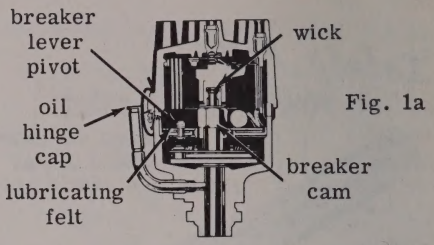


Fig. 1a

DISTRIBUTOR CAP REMOVAL AND INSTALLATION

1. Latch type as illustrated in Fig. 1b. This type of cap is held down by two latches. One on each side of the cap.

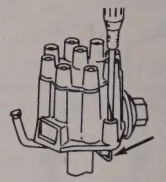


Fig. 1b.

   a. To remove, insert a screwdriver in upper slotted end of cap retainers, press down and turn until latch is disengaged.

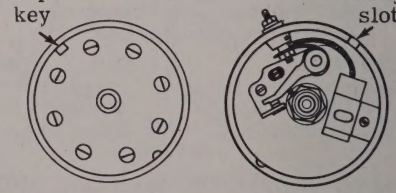


Fig. 1c

   b. To replace, seat cap on distributor by lining up the key (or keys) on the cap so that it seats into the slot on the distributor body. See Fig. 1c.

   c. Insert screwdriver in upper slotted end of cap retainers, press down and turn until latch is engaged.

OPERATING INSTRUCTIONS

Fig. 2a

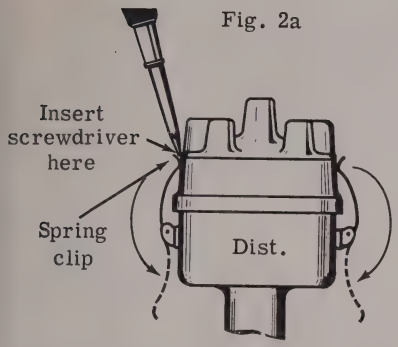
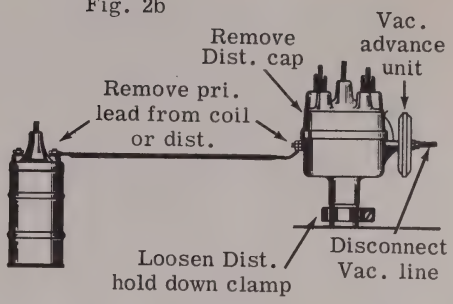


Fig. 2b



2. Spring Clip Type as illustrated in Fig. 2a. This type of cap is held down by two spring clips. One on each side of the cap.

   a. To remove, insert a screwdriver between the clip and the cap body. Hold cap down firmly with one hand and exert pressure up and out against clip with screwdriver. Fig. 2a.

   b. To replace, seat cap on distributor by lining up the key (or keys) on the cap so that it seats into the slot on the distributor body. See Fig. 1C.

   c. Hold cap firmly in place. Push in and slightly up against the clips until they slip over and seat on the cap spring lip.

DISTRIBUTOR REMOVAL AND INSTALLATION

TO REMOVE. See Fig. 2b.

a. Remove distributor cap as per instructions under, "Dist. Cap Removal".

b. Remove distributor primary lead from coil or distributor.

c. Disconnect vacuum line from vacuum advance unit on distributor.

d. Remove distributor hold down bolt and clamp located on distributor shaft underneath housing.

e. Mark a chalk line on engine or firewall for reference in direction rotor is pointing.

f. Slowly pull distributor up. On spline shaft type distributors rotor will turn as distributor is pulled up. The moment the rotor stops turning, mark another chalk line in the direction it is pointing.

TO INSTALL

a. Position distributor over distributor well in engine with vacuum advance unit lined up with vacuum line.

b. Turn rotor so that it is pointing at the second chalk line made when distributor was removed.*

c. Push distributor down slowly. When seated, the rotor should be pointing in the direction of the first chalk line made before the distributor was removed.

*Spline shaft distributors only-for other types only one mark is needed.

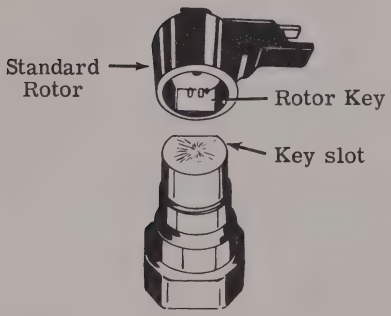
d. Place hold down clamp on distributor shaft and insert hold down bolt. Tighten down just enough so that distributor can be rotated with a little pressure.

e. Connect vacuum line to vacuum advance unit. (Unless otherwise specified in the Timing instructions for that car.)

f. Connect distributor primary lead to coil.

g. Adjust timing as per instructions under, "Engine Timing Adjustment".

Fig. 3a



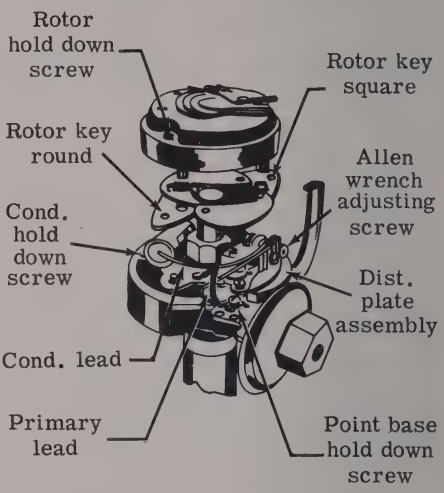
CONTACT POINTS REMOVAL AND INSTALLATION

TO REMOVE

a. Remove distributor cap as per instructions under, Distributor Cap Removal".

b. Remove Rotor. See Fig. 3a (Rotors having hold down screws) remove screws, Fig. 3b then remove rotor.

Fig. 3b



c. Remove condenser hold down screw. See Fig. 4a.

d. Remove hold down screw (screws) which hold the base of the contact set to the plate assembly in distributor. See Fig. 4a.

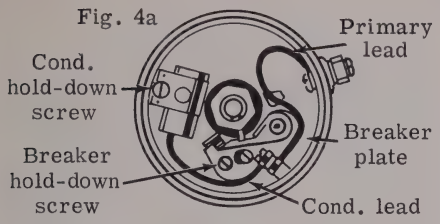
e. Disconnect primary and condenser leads at points.

f. Remove contact points and condenser from distributor.

g. Service and inspect as per instructions under, "Distributor Service".

OPERATING INSTRUCTIONS

Fig. 4a



TO REPLACE See Fig. 4a.

1. Position contact points over distributor breaker plate assembly, aligning the screw openings in the point set with screw holes in breaker plate assembly and install screws.

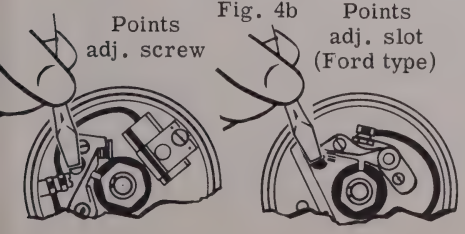
2. Install condenser and tighten hold down screw.

3. Connect primary and condenser leads to points. If contact points are not preassembled, it will be easier to connect the primary and condenser leads to the contact points before installing on the plate assembly in distributor.

4. Inspect leads as they must be properly positioned to eliminate interference between cap and breaker advance plate.

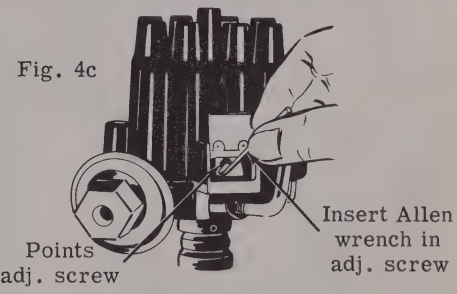
5. To adjust internal type distributors, connect dwell meter to distributor. Turn adjusting screw with screwdriver located in slot on points base until specified dwell is obtained. See Fig. 4b. (also page 18)

Fig. 4b



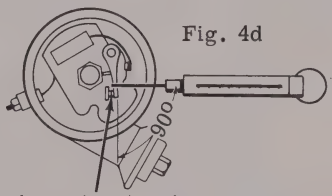
To adjust external type distributors, connect dwell meter to distributor. Insert Allen wrench into adjusting screw and turn until specified dwell is obtained. Dwell may also be adjusted on this type distributor with cap on and engine running by lifting the adjustment window on side of cap and inserting Allen wrench into adjusting screw. See Fig. 4c. (also page 18)

Fig. 4c



6. Check spring tension of contact points with spring tension scale. Use pliers to adjust spring tension. See Fig. 4d.

Fig. 4d

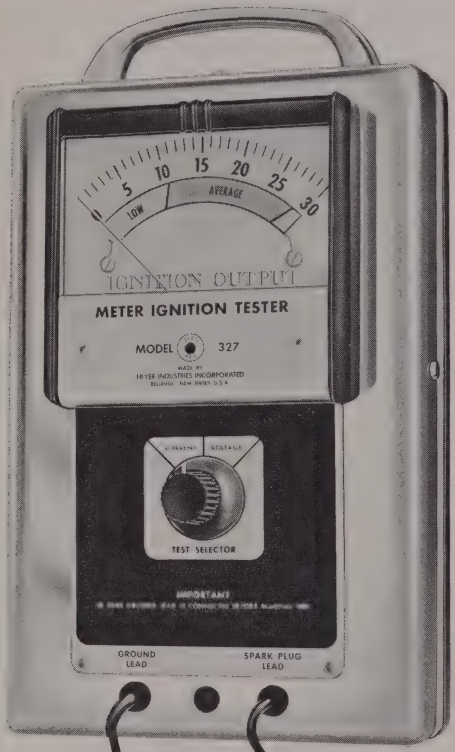


Hook spring tension gauge as near as possible to contact points and pull at right angle (90°).

7. Replace Rotor. Seat rotor by aligning key on rotor with slot on cam. Rotors with two hold down screws have two keys, one round, one square. Align with round and square holes located in cam weight base assembly, then seat.

METER IGNITION TESTER Model 327

OPERATING INSTRUCTIONS



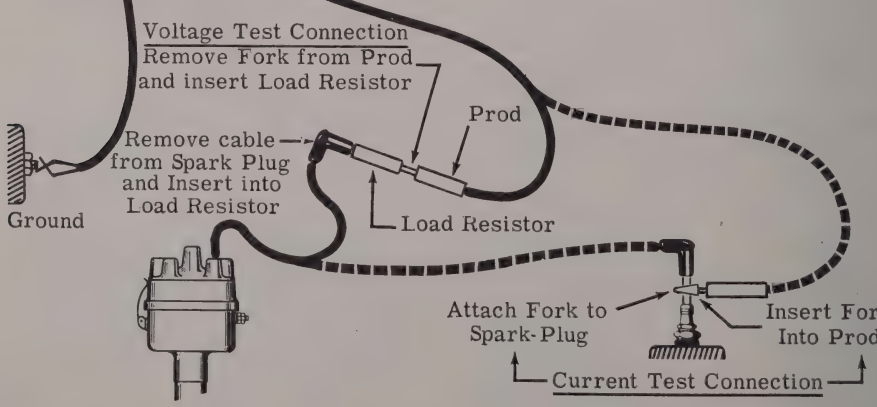
Connect Ground clip to ground.

CURRENT TEST: Set TEST SELECTOR to "CURRENT" position. Insert Fork into Tester Prod. Attach Forked Prod to most accessible spark plug (use spark plug adapter where necessary).

Start engine and increase speed to obtain highest meter reading in "AVERAGE" zone. If reading is in "LOW" zone repeat test on other plugs. Low zone readings indicate ignition trouble.

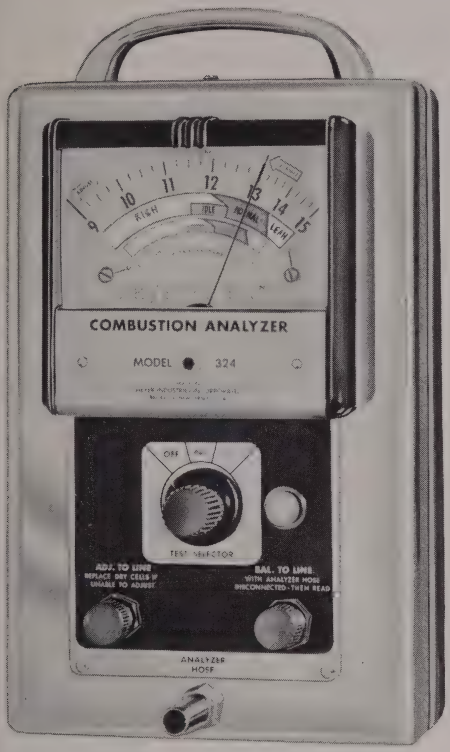
NOTE: If meter shows reverse reading on current, it indicates reversed polarity of coil.

VOLTAGE TEST: Stop engine. Turn TEST SELECTOR to "VOLTAGE" position. Remove Fork from Test Prod and insert Load Resistor. Remove most accessible spark plug wire and connect to Load Resistor. Start engine, gradually increase rpm noting meter reading. If reading stays in "LOW" zone repeat test on other spark plugs. Low zone readings indicate ignition trouble.



COMBUSTION ANALYZER Model 324

OPERATING INSTRUCTIONS



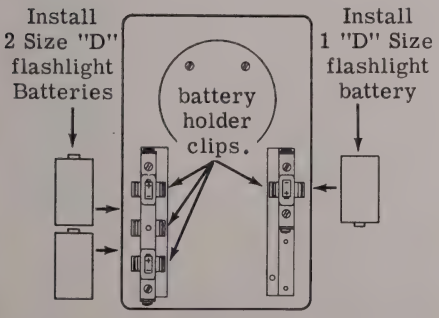


Fig. 1

PREPARING THE COMBUSTION ANALYZER FOR USE

a. Install Dry Cells. The analyzer operates from 3 Size D 1-1/2 volt flashlight cells. These are not included with the tester because of possible shelf-life failures. Remove screws at top, bottom and sides of tester that hold the chrome face to red case and carefully lift tester up and out. Install two batteries on one side, and one battery on the other side inserting between holder clips. (See Fig. 1) Reassemble case.

b. With TEST SELECTOR switch "OFF" meter pointer should be on its normal zero (13 on scale). If not, readjust the meter with Zero Adj.

c. Set TEST SELECTOR to "ADJ" position. Turn ADJUST TO LINE control until meter reads on the "Adjust" line. If pointer will not adjust to line - replace batteries.

d. Turn TEST SELECTOR to "BAL. AND READ" position and, if necessary, use the BAL. TO LINE control to bring pointer to the "Balance" line (13 on scale).

IMPORTANT: When checking balance line, which must be done before every use, be sure pick-up hose is disconnected from the tester. The purpose of the balance adjustment is to balance the meter and analyzing cell with no exhaust gas in the cell. If there is any it will seriously affect the air/fuel readings.

e. Connect Analyzer Pick-up hose to connection on tester marked "Analyzer Hose".

NOTE: Before connecting Pick-up, drain hose of any condensation. If tester is used for any length of time testing, periodically remove hose from tailpipe and tester and drain any condensation formed in hose. Air pressure may be used to blow out line. If hose becomes clogged erroneous Air/Fuel readings will result. Always remove hose from tester and blow air through hose towards pick-up. This is important because: Warranty does not cover Analyzer cells damaged by condensate from hose.

On DUAL EXHAUST SYSTEMS always place the pick-up tube in the pipe that does not have the heat riser, so you will be sure to pick-up a sample.

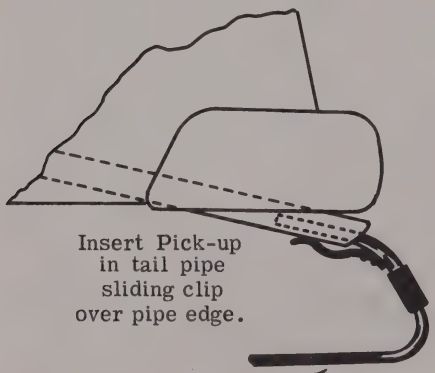


Fig. 2

You are now ready to check Air/Fuel ratio, which is made with the switch in the "Balance and read" position. (Pick-up should now be placed in the exhaust pipe as shown in Fig. 2).

ENGINE MUST BE AT NORMAL OPERATING TEMPERATURE BEFORE MAKING THIS TEST.

In other words, engine must be warmed up since a cold engine will be affected by the Automatic Choke and general inefficiency due to vaporizing fuel with cold air.

Check heat riser valve to see that it is free. If frozen, erroneous Air/Fuel readings will result.

AIR/FUEL RATIO

"ECONOMY" SYSTEM

Test Procedure

a. Adjust the throttle adjustment screw to bring engine speed to 2000 RPM.

b. The AIR/FUEL RATIO METER should show a reading of between 13 and 14.5 on the scale. High speed, high compression engines will usually run leaner than low speed engines. When the combustion analysis of a car fails to compare with that of other cars of the same make and model, check the air cleaner and choke. If the carburetor runs normal, with the air cleaner removed, the air cleaner is probably dirty and should be cleaned. If no improvement is evident, check the choke to make sure it is not partially restricting the air flow. If the choke is all right then the carburetor will have to be removed for overhaul.

AIR/FUEL RATIO

CURB IDLE SYSTEM

a. Use the tachometer (0-1000 RPM scale) to set the idle speed as called

for in the Roller Chart, or in accordance with Manufacturers Specifications. It is important to get the correct information because idle speeds vary with type of transmission and if an air conditioner is installed. Also some cars have special idle adjustments other than the usual throttle stop. The air/fuel ratio will usually be in the "IDLE" range, between 11 1/2 and 12 1/2 to 1 on older cars and slightly above 12 1/2 on many late model cars.

b. If the air/fuel ratio readings do not come within this range, it will usually be noted that the engine is not idling smoothly. Try turning the idle adjustment screw to either rich (out) or lean (in) extreme and note reaction on air/fuel meter. If engine roll increases, whereas some middle position results in the engine running smooth, the carburetor idle adjustment is functioning satisfactorily. If it is not possible to obtain the correct air/fuel ratio by this adjustment, follow whichever condition listed below that applies:

Reading too rich: Check for high float level, automatic or manual choke stuck, leakage past idle jet, plugged air passage, plugged idle bleed hole.

Reading too lean: Check intake manifold, carburetor flange bolts, low float level, plugged idle jet.

AIR/FUEL RATIO - ACCELERATING SYSTEM

a. Increase engine speed to 2000 RPM. When the meter pointer stops climbing momentarily open the throttle wide and quickly release, observing the action of the AIR/FUEL RATIO METER pointer.

b. If the pump is operating correctly, the meter pointer will first move toward the rich side of the scale and then toward the lean side. If the meter pointer fails to show any change in reading, turn the engine off and look down the throat of the carburetor, depress the throttle and see if the jets "squirt" gasoline. If they do not, check to see that the pump linkage has not become disengaged. If this checks O.K., the pump discharge opening may be clogged or the pump packing may be leaking. Carburetor needs overhaul in this case.

ALWAYS TURN UNIT "OFF" IMMEDIATELY AFTER USE TO CONSERVE BATTERY LIFE.

CARBURETOR
ADJUSTMENT PROCEDURE

Carburetors are usually composed of two or more sections. These sections are held together with screws. Check these screws for tightness. Check Carburetor intake-manifold mounting bolts for tightness. Looseness of these screws or bolts cause air leaks that upset carburetor adjustment.

Before adjusting carburetor, warm engine to normal operating temperature. Make sure the automatic choke is "open" and engine is on "slow idle". Always set hand brake "on".

IDLE ADJUSTMENT

a. Remove Air Cleaner and Connect Combustion Analyzer per instructions.

b. Adjust idle speed to manufacturer's specifications with throttle adjusting screw. See Fig. 3 and 4.

c. Slowly turn one idle-mixture adjusting screw in or out until maximum RPM is obtained. Repeat this step with the other idle mixture screw. These screws are usually located in front or rear and near the base of the carburetor (Fig. 3 and 4). Single barrel carburetors usually have one mixture screw located on the side of carburetor. Use care when adjusting mixture screws. Never tighten screws as damage to the needle will result and it will have to be replaced before carburetor can be adjusted.

d. After maximum RPM is obtained by the idle mixture adjusting screw reset the idle RPM to specifications with the throttle adjusting screw.

e. Note Combustion Analyzer readings. A Ratio between 11.50 and 12.50 is considered satisfactory for average driving conditions. If a reading is on the "rich" side of the "idle" block, turn the idle mixture screws "in" to obtain a "leaner" mixture. If the reading is on the "Lean" side, turn the idle mixture adjusting screws "out" to obtain a richer mixture. Note: Some high compression engines normally run slightly lean. This can be determined by checking other cars of the same make and model.

f. Stop Engine and Install air cleaner.

g. Start engine and note readings again on the Combustion Analyzer. If there is half air/fuel Ratio or more change in analyzer readings check air filter as per instructions under "Carburetor Air Filter Service".

AUXILIARY AIR ADJUSTMENT CARBURETORS WITH IDLE AIR BY-PASS ADJUSTING SCREW.

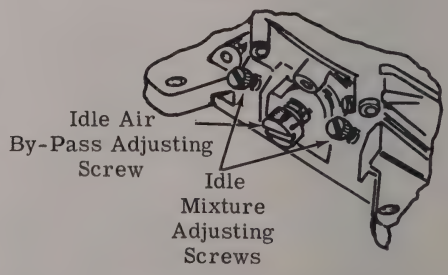
To adjust idle on carburetors with an idle air by-pass adjusting screw instead of a throttle adjustment screw use the same procedure as instructed under "IDLE ADJUSTMENT" except:

a. Loosen or disconnect accelerator linkage at carburetor to prevent linkage interference with idle adjustment. After idle adjustment is completed reconnect the linkage, idle speed should remain the same. If it doesn't, see service manual for linkage adjustment procedure.

b. Set idle speed to specifications by adjusting idle air by-pass adjusting screw on carburetor throttle body. (Air Conditioner should be operating on cars so equipped). Use the minimum amount of air possible to obtain the proper idle speed by turning in and out the idle air by-pass adjusting screw. See Fig. 3.

c. Turn one idle mixture adjusting screw and then the other in or out to obtain maximum RPM. See Fig. 3.

Fig. 3



Typical Auxiliary Air Adjustment Carburetor

d. Repeat step "b" to reset idle RPM.

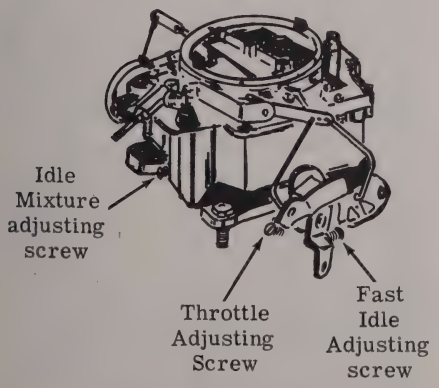
e. Repeat steps "b" and "c" until turning the mixture screws will not cause an increase in engine idle RPM, and the smoothest engine idle is obtained.

NOTE: Dual Carter Carburetors with an idle air by-pass adjusting screw instead of a throttle adjustment screw are adjusted in the same manner as the Rochester Carburetor with idle air by-pass adjusting screw.

FAST IDLE ADJUSTMENT

a. Start engine and allow engine to reach operating temperature and automatic choke open. This adjustment is performed with transmission in neutral and hand brake set "on".

b. Hold throttle lever in a position so that the fast idle adjusting screw rests on manufacturers specified step of fast idle cam. See Fig. 4.



Typical Carburetor with throttle adjusting screw

Fig. 4

c. With the fast idle adjusting screw resting on the specified step of the fast idle cam, adjust the engine RPM to manufacturers specifications.

WHAT TO DO IF UNIT IS NOT OPERATING NORMALLY

First - Recheck operating instructions.
Second - Try on another car.

(Usual troubles are as follows - check before returning unit for service.

a. Meter Pointer cannot be adjusted to line.

   a. Test Selector not set to "adjust" position.

   b. Batteries worn out or not installed correctly.

b. Meter pointer does not respond to changes in air/fuel ratio as idle jet is adjusted.

   a. This is usually due to placing pick-up tube in pipe with heat riser. If it is closed no exhaust gas will be picked-up.

   b. This can also be due to a very leaky exhaust system, bad muffler, etc., that allows air to get in system and exhaust gas out before reading pick-up.

Warning. Condensate in hose will cause erratic readings or prevent any change in readings. Hose should be blown out after each use. See Page 14.

DWELL-TACH TESTER Model 323

OPERATING INSTRUCTIONS

The Dwell-Tach Tester obtains power from four Size D 1-1/2 volt flashlight batteries located inside of tester. The batteries are not supplied with tester because of possible shelf-life failure. To install, remove screws at top, bottom and sides of tester holding chrome face to red case. Lift chrome tester up and out and install batteries according to polarity on decals inside of battery holders. Then reassemble tester.

ZERO ADJUST: With Test Selector "OFF" meter pointer should align with "0" on meter scale. To align, turn the "ZERO ADJ" screw.

DWELL READINGS

Set TEST SELECTOR to "DWELL" position and connect test clips together. Align meter pointer to "SET" line located on 8 cylinder scale using control marked "ADJUST DWELL". (If unable to adjust, replace batteries.

Connect BLACK clip to ground on Neg. ground system, RED clip to ground on Pos. system.

Connect other clip to primary terminal on distributor or coil terminal distributor primary wire connects to.

Start engine and with TEST SELECTOR in "DWELL" position observe dwell reading on appropriate 4, 6, or 8 cylinder Cam Angle scale.

TACHOMETER READINGS

For Tachometer reading turn TEST SELECTOR to "TACH LO" position and read RPM on appropriate 4, 6, or 8 cylinder scale. For high speed RPM set TEST SELECTOR to "TACH HI" position and double RPM readings.

NOTE: Red light indicates power is being consumed from flashlight batteries by tester. When not using tester turn Test Selector OFF to preserve batteries.

WHAT TO DO IF UNIT IS NOT OPERATING NORMALLY.

First - Recheck operating instructions.
Second - Try on another car.

(If trouble is that pointer cannot be adjusted to "set" line - replace batteries).

AMPS-VOLTS-REGULATOR TESTER Model 322

OPERATING INSTRUCTIONS

DESCRIPTION

METER The meter consists of a 0-18 volt scale, 2/10ths volt per division and a 0-60 amps ammeter scale, 2 amps per division. There are seven blocks marked "PTS", "CRK", "COIL" and "REG" which are used to simplify voltage tests.

The TEST SELECTOR KNOB has three positions. The "60 AMPS" position for measuring current; the "18 VOLTS" position for measuring voltage, and an "OFF" position which disconnects the meter from the clips.

ZERO ADJ. With TEST SELECTOR turned to "OFF" position, meter needle should align with "0". If not, turn "ZERO ADJ" screw located just under meter to align meter needle with "0".

The tester is so designed that in the course of hooking up test leads should a wrong connection be made no damage will result to meter except possibly in using the VOLTAGE AMPLIFIER.

TEST CLIPS. There are two pairs of rubber-booted test clips. One pair is connected to the heavy insulated ammeter leads for measuring current. The other pair is connected to the light insulated voltmeter leads for measuring voltage and resistance. You should not attempt to make tests until you are familiar with the use of meters. (Damage done by incorrect usage is not within the Warranty).

RES. OUT AND RES. IN POSTS. The ammeter lead is connected to the "RES. OUT post for all current tests. The ammeter lead is connected to the "RES. IN" post only during voltage regulator tests which prevents inaccurate readings due to discharged battery conditions. Otherwise it is connected to the "RES. OUT" post.

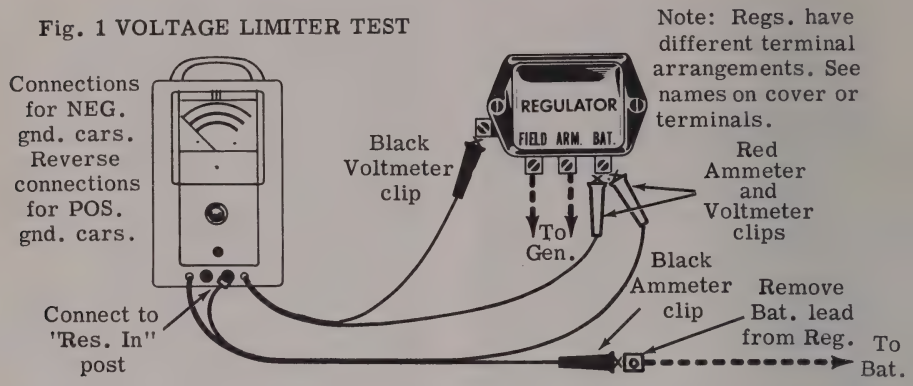
VOLTMETER AMPLIFIER BUTTON

This button when pressed increases the sensitivity by 10 times to make the full voltmeter scale reading 1.8 volts for measuring voltage loss in wires, connections and contacts.

Care should be taken when using "VOLTAGE AMPLIFIER BUTTON". See test following before using this button.

OPERATING INSTRUCTIONS

Fig. 1 VOLTAGE LIMITER TEST


Note: Regs. have different terminal arrangements. See names on cover or terminals.
Connections for NEG. gnd. cars. Reverse connections for POS. gnd. cars.
REGULATOR
FIELD ARM. BAT.
Black Voltmeter clip
Red Ammeter and Voltmeter clips
To Gen.
Black Ammeter clip
Remove Bat. lead from Reg.
To Bat.
Connect to "Res. In" post

NOTE: In the case of Delco-Remy double contact voltage regulators which can be discerned from standard type regulators by either the warning on the car, the model number or by removing the cover to see if the voltage regulator has a double set of contacts, a Heyer #31456 Field Rheostat must be used in conjunction with the tester to test the voltage regulator. Instructions are enclosed with the Rheostat.

1. VOLTAGE LIMITER TESTS
   For Neg. Ground Cars. Fig. 1.

   a. Remove battery lead from regulator "BAT" terminal.

   b. Connect RED gloved ammeter lead to regulator "BAT" terminal.

   c. Connect BLACK gloved ammeter lead to regulator battery lead.

   d. Connect RED gloved voltmeter lead to regulator "BAT" terminal.

   e. Connect BLACK gloved voltmeter lead to ground at regulator case.

   NOTE: For POS. ground cars reverse connections.

   f. Connect ammeter lead to RES. IN post on tester.

   g. Turn TEST SELECTOR to 18 volts position.

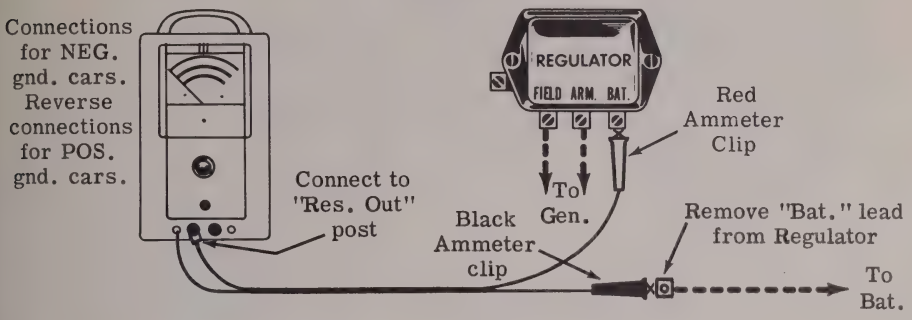
   h. Start engine and increase speed to approximately 1000 - 2000 RPM. Voltmeter will now read regulator voltage setting, regardless of state of charge of battery. (Engine should be at normal operating temperatures).

   i. Check charging voltage. If it is above the "REG" block the charging voltage is too high and must be corrected or it will greatly shorten battery life. If it reads below the block it will reduce the voltage available at the coil, hence coil Kilo-Volt output will be low. This low voltage will also allow the battery to gradually run down and must be corrected.

   j. To determine if the generator is charging reduce engine RPM gradually to idle and note if the voltage decreases. If the pointer does not move regardless of engine speed it indicates either a defective regulator or that the generator is not charging. See Test 4 - Generator Output.

Fig. 2
CURRENT LIMITER TEST

Note: Regs. have different terminal arrangements. See names on cover or terminals.



2. CURRENT LIMITER TEST

For NEG. Ground Cars

a. Remove battery lead from regulator "BAT" terminal.

b. Connect RED gloved ammeter lead to regulator battery terminal.

c. Connect BLACK gloved ammeter lead to regulator battery lead.

NOTE: For POS. ground cars reverse connections.

d. Connect ammeter lead to RES. OUT post on tester.

e. Turn TEST SELECTOR to 60 Amp position.

f. With ignition OFF (remove coil distributor H.T. lead if starter is on ignition switch) crank engine over for 15 seconds. Then put on headlights, radio, heater, etc.

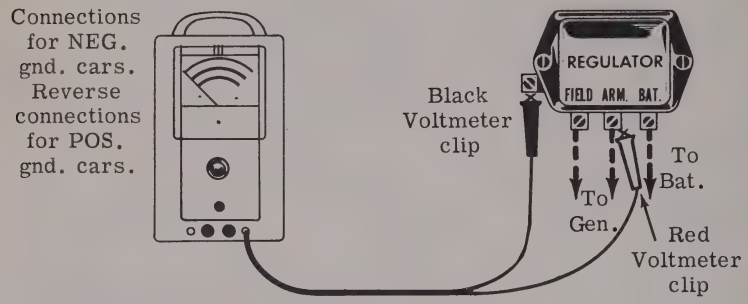
(The purpose of this is to remove the surface charge from the battery plates so a maximum charge will be taken from the generator).

g. Start engine and increase speed to approximately 1500 RPM. Meter will read maximum generator current controlled by regulator.

Note: If you have already made connections for the Voltage limiter test (Fig. 1), it is only necessary to move the Ammeter lead from RES. IN to RES. OUT post on tester and proceed with Par. (e) above.

Fig. 3
REGULATOR CUT-OUT TEST

Note: Regs. have different terminal arrangements. See names on cover or terminals.



3. REGULATOR CUT-OUT TEST

For NEG. Ground Cars

a. Connect RED gloved voltmeter lead to "ARM" or "GEN" terminal of regulator.

b. Connect BLACK gloved voltmeter lead to ground at regulator.

NOTE: For POS. ground cars reverse connections.

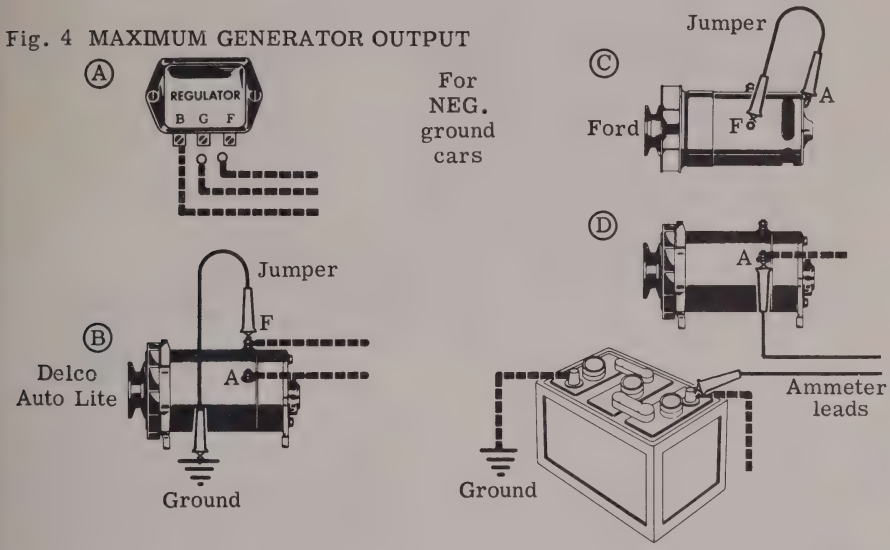
c. Turn TEST SELECTOR to 18 volt position.

d. With engine OFF, voltmeter should indicate "0". If voltmeter indicates battery voltage then regulator cut-out points are stuck closed and regulator cut-out must be adjusted. Usually cut-out points are badly burned and regulator must be replaced.

e. Start Engine. Voltmeter should now read 2-4 volts on 6-V systems and slightly higher on 12-V systems. If voltmeter reads battery voltage or higher, cut-out closing voltage is set too low and must be adjusted to manufacturers specifications.

f. Increase engine speed slowly until voltmeter just dips. The reading just before voltmeter dips is the closing voltage of the cut-out.

Fig. 4 MAXIMUM GENERATOR OUTPUT



4. MAXIMUM GENERATOR OUTPUT (Regulator not in circuit)

   a. Turn TEST SELECTOR to "60 AMPS" position.

   b. Connect Ammeter lead to RES. OUT post on tester.

   c. Remove generator "field" and "arm" wires from regulator terminals. See "A" in Fig. 4.

   d. Connect a jumper between Generator field terminal and ground or between field terminal and armature terminal. See "D" or "C" in Fig. 4.

   e. Start engine, let it idle. Then connect ammeter leads between generator armature terminal and ungrounded battery terminal as in "D" Fig. 4, observing polarity as follows:

      Negative Ground Car - POS (Red Gloved) Ammeter lead to generator armature terminal.

      Positive Ground Car - NEG (Black Gloved) Ammeter lead to generator armature terminal.

   f. Increase engine speed momentarily to obtain generator output on Ammeter. Generator output should be approximately 1-1/2 times current limiter setting on vehicle regulator. If current limiter setting is 30 amps, then Generator output should be at least 45 amps. DO NOT RUN GENERATOR AT FULL OUTPUT FOR MORE THAN 5 SECONDS. With engine turned off immediately disconnect ammeter leads from Generator and Battery or overheating of Generator will result.

OPERATING INSTRUCTIONS

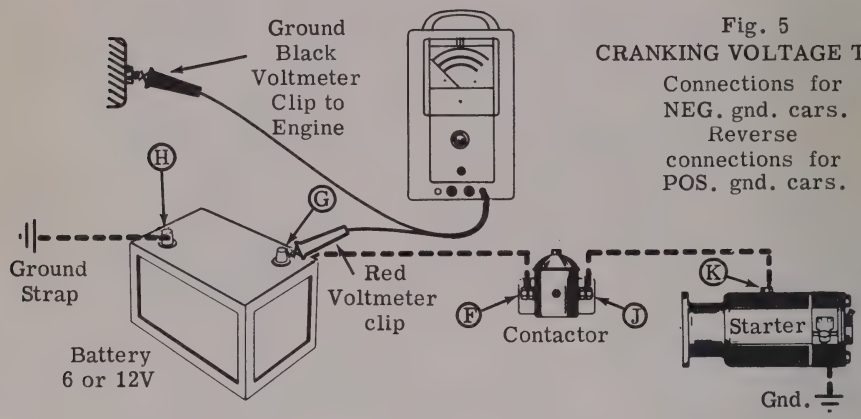


Fig. 5
CRANKING VOLTAGE TEST
Connections for NEG. gnd. cars. Reverse connections for POS. gnd. cars.

5. CRANKING VOLTAGE TEST (For checking starter circuit and battery).

   a. Connect RED voltmeter clip to the ungrounded battery terminal at "G" in Fig. 5. Ground BLACK clip to engine.

      (REVERSE CONNECTIONS FOR POSITIVE GROUND CAR).

   b. Remove coil distributor H.T. lead from distributor or coil tower.

   c. Turn TEST SELECTOR to 18 volt position.

   With ignition key ON crank engine over and note reading on meter. The reading should be in the CRK block on meter scale. If reading is below the block this indicates low cranking voltage and must be corrected.

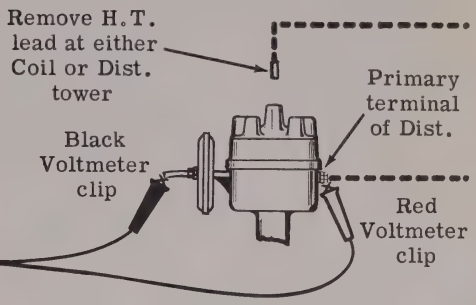
   Check battery "State of Charge" with Heyer Model 305B battery regulator voltage tester. If battery is below half charged it should be recharged and retested and replaced if after charge capacity test shows this to be necessary. If cranking voltage is still low after recharging battery follow the diagram (Fig. 5) and while cranking engine over move Red clip to terminals marked "F", "J" and "K". The difference read on meter between each of these points should not exceed 2/10ths volt. If larger differences are found, clean and tighten terminals. In the case of the contactor if the difference from "F" to "J" is larger than .2 replace the contactor.

   To check the ground strap, connect BLACK clip to battery terminal at "H" and RED clip to ground on engine (reverse connections for positive ground car). With engine cranking over press the VOLTMETER AMPLIFIER BUTTON. Reading over 1/10th volt indicates a poor connection at the ground or battery terminal and must be corrected.

   If all circuits are in good condition then it indicates starter is drawing an abnormally high current, and needs replacement or overhaul.

Connections for NEG. gnd. cars. Reverse connections for POS. gnd. cars.

Fig. 6
BREAKER POINT RESISTANCE



6. BREAKER POINTS RESISTANCE

a. Remove coil distributor H.T. lead from either coil or distributor tower.

b. Turn TEST SELECTOR to 18 volt position.

c. Make connections as shown in Fig. 6. For Negative ground car connect BLACK voltmeter clip to ground and RED voltmeter clip to the primary terminal of distributor

(REVERSE CONNECTIONS FOR POSITIVE GROUND CAR).

d. With ignition Key "ON" crank engine until it stops in a "points closed" position. This will be indicated by the voltage reading being very low usually less than one volt. CAUTION: Breaker points must be closed before pressing the "VOLTMETER AMPLIFIER BUTTON" which connects the 1.8 volt scale or damage to meter can result.

e. With ignition key still "ON" press the VOLTMETER AMPLIFIER BUTTON which connects the 1.8 volt scale. If reading is above the "PTS" block on the meter scale there is excessive resistance at the breaker points. Excessive resistance is usually caused by burned or badly pitted breaker points requiring replacement.

OPERATING INSTRUCTIONS

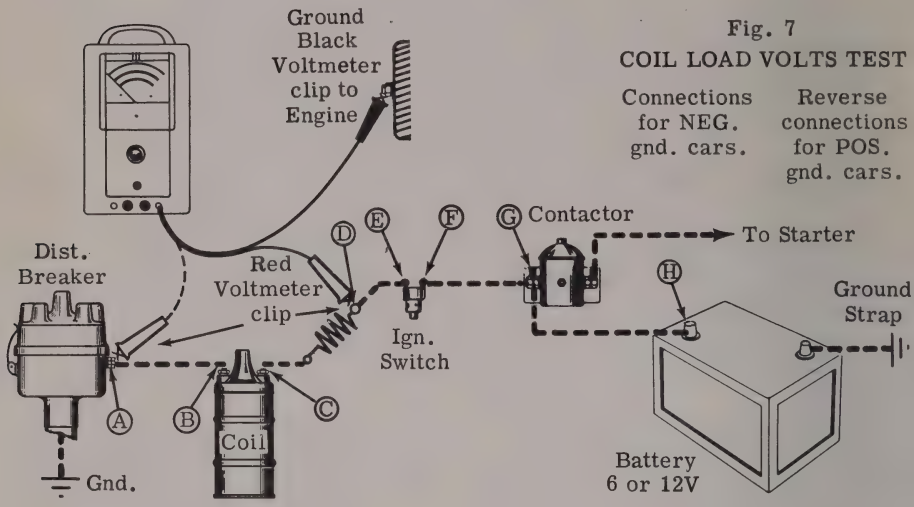


Fig. 7
COIL LOAD VOLTS TEST

Connections for NEG. gnd. cars. Reverse connections for POS. gnd. cars.

7. COIL LOAD VOLTS

POINTS MUST BE IN A CLOSED POSITION TO MAKE THIS TEST.

a. Connect RED voltmeter clip to distributor primary lead terminal at coil or distributor with ignition switch "on", engine stopped. Ground BLACK clip to engine. If points are closed reading will be less than 1 volt. If not remove coil-distributor H.T. lead crank engine momentarily until it stops with points closed.

b. Now move RED voltmeter clip from "A" or "B" to the BAT or "hot" terminal of the coil primary at "C" (if a resistor is used in series with the coil, then connect to ignition switch side of this resistor at "D" in Fig. 7). NOTE: This test cannot be made on late model cars that have resistor primary wiring in place of a resistor unit.

REVERSE CONNECTIONS FOR POSITIVE GROUND CAR.

c. Turn TEST SELECTOR to 18 volt position.

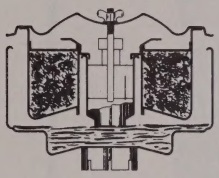
d. Turn ignition key "ON". With the points closed this will check the coil input volts under load which checks the entire coil primary circuit for excessive losses (See Fig. 7).

The reading should be in the coil block on the meter scale. If not, "coil load volts" is low which can be caused by discharged battery, poor wiring connections, defective wiring, defective ignition switch. To pinpoint resistance causing loss following diagram (Fig. 7) move RED clip to "E", "F", "G" and "H" until located. Try "Wiggling" ignition key to check condition of ignition switch contacts, if voltmeter needle fluctuates ignition switch is defective.

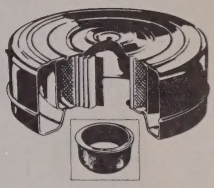
CARBURETOR AIR FILTER SERVICE

OPERATING INSTRUCTIONS

Oil-Wetted Type



Oil Bath Type



Dry Fibre Type

Carburetor air cleaners primarily remove dust and dirt from the air that is taken into the carburetor and engine. A dirty or clogged air cleaner causes poor carburetion, excessive gasoline consumption and poor engine performance. Air Cleaners should be serviced periodically as per manufacturers instructions, usually every five thousand miles and more often if car is used in dusty areas.

There are three basic types of air cleaners. Oil-Wetted, Oil-Bath, and Dry Fiber replaceable type. Each type uses a different service technique.

OIL-WETTED TYPE: Remove Cover Wing Nut, cover and filter element. Wash filter element thoroughly in a cleaning solvent. Allow element to Dry. Dip in clean engine oil and drain surplus oil from element. Wipe the Air cleaner Body clean and install the element, cover and secure with the wing nut.

OIL BATH TYPE: Remove air cleaner assembly from carburetor and remove cover wing nut, cover and filter assembly. Empty oil out of cleaner and clean out oil and accumulated dirt and wash body with cleaning solvent. Wash the filter assembly by sloshing up and down in the cleaning solvent. Allow to drain and dry. Refill the body of the air cleaner to the "OIL LEVEL" mark with oil specified by manufacturer, usually a heavy-weight oil and, in exceptionally cold climates a lighter-weight oil. Assemble the filter and cover assembly to body of cleaner. Check the carburetor air cleaner flange gasket for breaks or creases that will prevent air cleaner assembly from seating properly. Install air cleaner on carburetor making sure it is set down securely and tighten clamps and mounting screws and install cover wing nut.

DRY FIBER TYPE: Remove wing nut, cover and filter assembly. Tap element lightly on a flat surface until all loose dust has been removed. Do not clean by any other method or element will be damaged. Do not wash, air blast or oil element. Thoroughly inspect the element visually for any breaks or holes in the fiber. Replace the element if any possible dust leaks are found. Wipe all dust from interior of air cleaner. Install filter, cover and wing-nut.

Service the Dry fiber element every five thousand miles; more often if car is used in dusty areas. Replace element every fifteen thousand miles unless otherwise specified by manufacturer.

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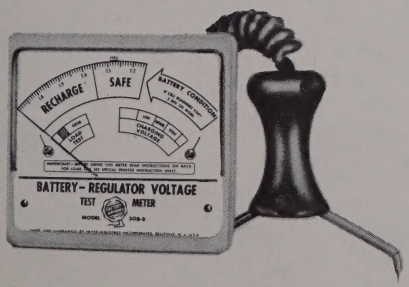

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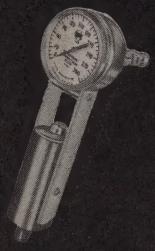

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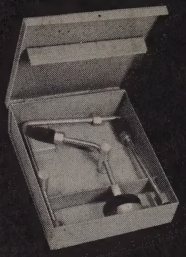

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Model 347
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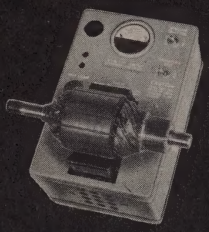

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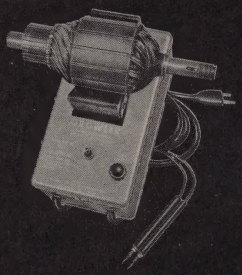

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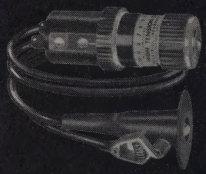

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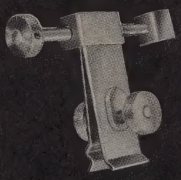

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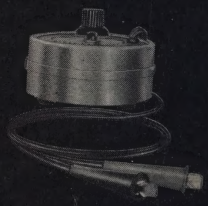

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